

What is claimed is:

1. A heat spreader for spreading heat generated by high power density devices, the heat spreader comprising:
 - a. at least one cooling chamber containing liquid metal, the at least one cooling chamber allowing the liquid metal to come in direct contact with the high power density device; and
 - b. electromagnetic pump means for circulating the liquid metal in the at least one cooling chamber, the liquid metal circulating in the at least one cooling chamber, the circulation spreading the heat generated by high power density devices over the heat spreader.
2. The heat spreader as recited in claim 1 wherein the liquid metal in the at least one cooling chamber is an alloy of gallium and indium.
3. The heat spreader as recited in claim 1 wherein the liquid metal in the at least one cooling chamber is selected from a group consisting of indium, gallium, mercury bismuth tin alloy, bismuth lead alloy and sodium potassium eutectic alloy.
4. The heat spreader as recited in claim 1 wherein the system further comprises an electromagnetic interference shield.
5. The heat spreader as recited in claim 1 wherein the cross-section of heat spreader is selected from a group consisting of circular, rectangular and hexagonal.
- 20 6. The heat spreader as recited in claim 1 wherein the heat spreader has four cooling chambers.
7. The heat spreader as recited in claim 1 wherein the system further comprises a thermoelectric generator for generating power for running the electromagnetic pumps, the thermoelectric generator utilizing the temperature difference between its ends to generate power.

8. A system for efficiently dissipating heat from a high power density device, the system comprising:

a. a heat spreader positioned adjacent to the high power density device, the heat spreader comprising:

5 i. at least one cooling chamber containing liquid metal;

ii. at least one outlet carrying liquid metal from the at least one cooling chamber;

iii. at least one inlet returning liquid metal to the at least one cooling chamber;
and

iv. at least one electromagnetic pump pumping the liquid metal;

10 b. means for cooling the liquid metal, the cooling means being placed at a predefined distance away from the heat spreader; and

c. at least one conduit circulating the liquid metal between the heat spreader and the cooling means, the conduit being connected to the outlet and the inlet, the conduit carrying away the heated liquid metal from the cooling chamber through
15 the outlet to the cooling means and returning the liquid metal to the cooling chamber through the inlet.

9. The system as recited in claim 8 wherein the high power density device is located in a folding microelectronic device.

10. The system as recited in claim 9 wherein the at least one conduit is constructed
20 using a flexible material to allow bending.

11. The system as recited in claim 9 wherein the at least one conduit comprises a flexible portion for transferring the liquid metal across a bend.

12. The system as recited in claim 9 further comprising a hinge, the hinge comprising an integrated conduit, the integrated conduit allowing transfer of the liquid metal across
25 a bend from at least one conduit to at least one other conduit.

13. The system as recited in claim 8 wherein the means for cooling the liquid metal is a heat sink.
14. The system as recited in claim 8 wherein the means for cooling the liquid metal comprises a liquid-heat pipe heat exchanger, a heat pipe and a heat sink.

5 15. A system for efficiently dissipating heat from a high power density device, the system comprising:

- a. a heat spreader positioned adjacent to the high power density device, the heat spreader comprising:
 - i. at least one cooling chamber containing liquid metal; and
 - 10 ii. at least one electromagnetic pump arranged so as to circulate the liquid metal in the at least one cooling chamber;
- b. a heat pipe absorbing heat from the heat spreader; and
- c. means for cooling the heat pipe, the cooling means being placed at a predefined distance away from the heat spreader.

15 16. The system as recited in claim 15 wherein the means for cooling the heat pipe is a heat sink.

17. The system as recited in claim 15 wherein the means for cooling the heat pipe comprises a liquid-heat pipe heat exchanger, a conduit and a heat sink.